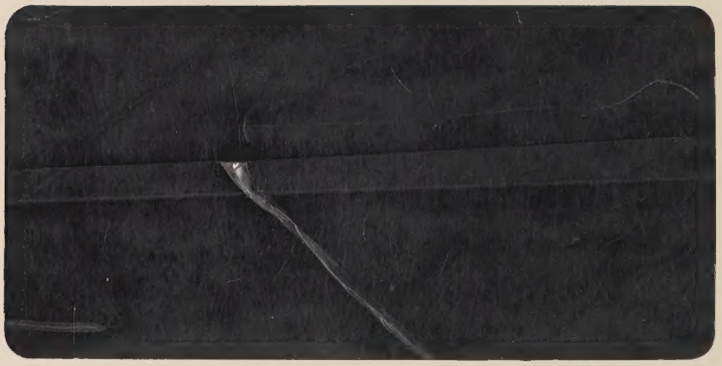
CXR telcom



OPERATION MANUAL

MODEL 701A

TRANSMISSION TEST SET

Part Number: 4200-0017-00
Revision: B
Date: April 1987

CXR Telcom Corporation
755 Ravendale Drive, Mountain View, CA 94043
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‹ Mountain View, California 1987 ›

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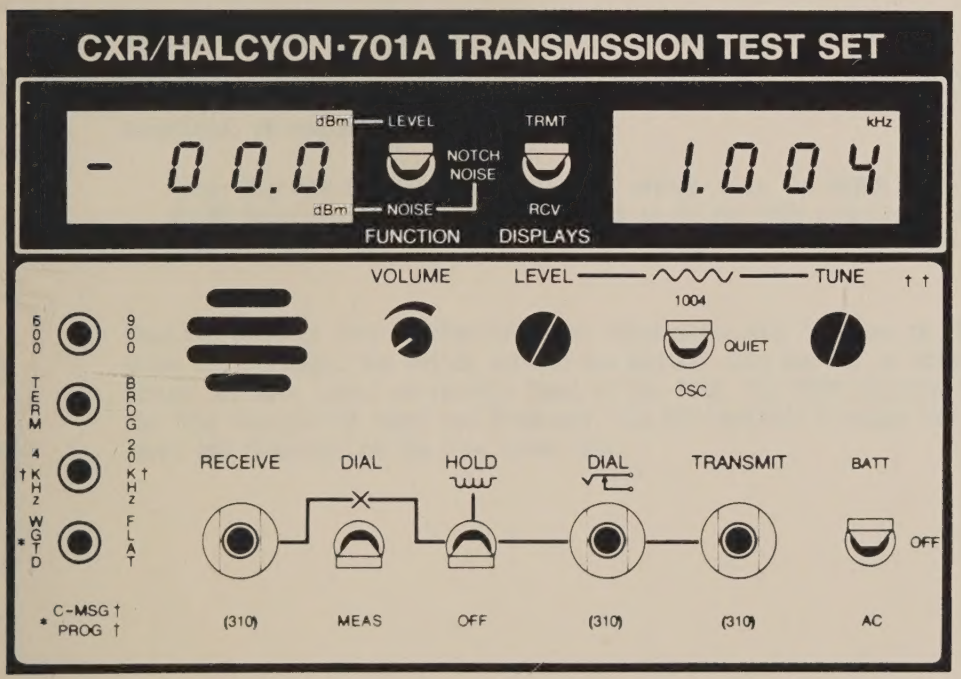
SECTION 1 — INTRODUCTION

1.1 GENERAL DESCRIPTION

The CXR/Halcyon model 701A is a rugged, portable transmission line monitor which performs level, frequency, idle channel noise and notch noise tests. When set to the 4KHZ mode, the 701A operates up to 4kHz and provides C-Message and 3kHz Flat noise measurement filters for monitoring voice frequency channels. When set to the 20KHZ mode, the 701A operates up to 20kHz and provides Program and 15kHz Flat noise measurement filters for monitoring program channels.

The 701A has a transmitter and a receiver which provide for the testing of 4-Wire dedicated circuits. 2-Wire dial-up circuits may also be tested through the use of the DIAL and HOLD functions. Se;arate LEDs are ;rovided for the simultaneous reading of frequency and level.

The 701A is powered by AC volts or from internal rechargeable batteries.

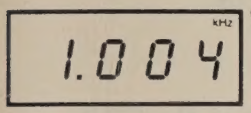


SECTION 2 — FUNCTIONAL DESCRIPTION

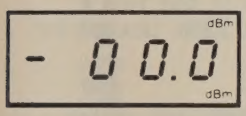
2.1 701A FRONT PANEL CONTROLS AND INDICATORS

The 701A front panel controls and indicators can be thought of in terms of five functional groups: **Display, Transmit, Receive, Line Interface,** and **Power.**

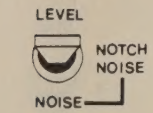
Display Controls



The green (right-hand) LED display shows the transmitted/received frequency.



The red (left-hand) LED display shows the power level (dBm, dBrn) of the parameter being tested.

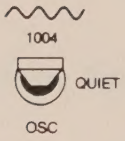


This three position toggle switch controls the dBm/dBrn display. In the **LEVEL** function, depending upon the position of the **DISPLAYS** switch, the 701A measures the "dBm" level being transmitted or received. In the **NOTCH NOISE** and **NOISE** functions, it measures noise in "dBrn".

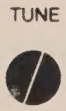
> **Note:** When the **LEVEL/NOTCH NOISE/NOISE** switch is in the **NOTCH NOISE** or **NOISE** functions and the **DISPLAYS** switch is in the **TRMT** position, the display will blank.

This two-position switch determines what information will be shown on the red and green LED displays. The switch affects the display only and has no affect on the actual transmit output or receive input of the 701A. The **TRMT** position displays the 701A transmitted level and frequency. The **RCV** position displays the measured level and frequency of the line under test.

Transmit Controls



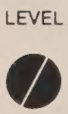
This three-position switch controls the 701A transmitter. The **1004Hz** position outputs a precise, low distortion holding tone. The **QUIET** position mutes the 701A transmitter, but maintains the terminating impedance load on the **TRANSMIT** connector. The **OSC** switch position activates the tunable frequency oscillator.



The **TUNE** knob sets the frequency of the transmitted signal. The control is only active when the 1004/QUIET/OSC switch is set to the OSC position.

This two-position switch selects the transmit frequency range of the 701A's tunable oscillator. **4kHz** is used for testing VF circuits and **20kHz** is used for testing Program circuits.

> **Note:** This switch is also used in coordination with the **WGTD/FLAT** switch to select the desired noise measurement filter.



The **LEVEL** knob sets the output level of the transmitted signal.

Receive Controls

This switch is used in coordination with the 4KHZ/20KHZ switch to select the desired noise measurement filter. **WGTD/FLAT** switch operation affects only noise measurements.

Noise Filter	Switch Settings
C-Message	4KHZ/WGTD
3kHz Flat	4KHZ/FLAT
Program	15KHZ/WGTD
15kHz Flat	15KHZ/FLAT

Controls the volume of the speaker. The speaker monitors the 701A transmitter or receiver depending upon the position of the **TRMT/RCV** switch.

Power

This three-position power switch applies power (ac or internal battery) to the 701A.

Line Interface

TRANSMIT

(310)

The 701A transmits test signals through this #310-type connector.

RECEIVE

(310)

The 701A measures signals received through this #310-type connector.

This two-position switch selects the termination impedance of the TRANSMIT and RECEIVE connectors.

The **TERM** switch position causes the 701A to load the RECEIVE line under test with the selected impedance value. In the **BRDG** switch position, the 701A does not load the receive line and instead monitors through a high (>25k ohm) input impedance. This switch operation has no affect on the TRANSMIT jack.

DIAL

(310)

This is a 310-type connector that is used to connect a telephone test handset ("butt in") for dialing and talking on a 2-Wire line. When the handset is inserted in the **DIAL** jack, the **DIAL** and **RECEIVE** jacks are connected to one another.

HOLD

OFF

This two position switch, when put in the **HOLD** position, inserts a holding circuit across the 2-Wire circuit that is connected to the RECEIVE 310-jack. Selecting **HOLD** takes the line "off hook"; selecting **OFF** places the line "on hook". When testing 4-Wire dedicated circuits, leave this switch in the **OFF** position.

DIAL

MEAS

This two position switch is used for testing 2-Wire dial-up circuits. When a handset is connected to the DIAL jack, this switch is used for dialing through the RECEIVE connector. After the circuit has been dialed, and the handset removed, this switch is then used to reverse the direction of the test through the RECEIVE connector. In the **MEAS** position, the 701A measures incoming signals thru the connector. In the "**X**" position, the 701A transmits test signals thru that same connector. This operation allows testing to be performed in both directions without disconnecting (interrupting loop current) the dial-up circuit. When testing 4-Wire dedicated circuits, leave this switch in the **MEAS** position.

SECTION 3 — TRANSMISSION LINE MEASUREMENTS

3.1 CONNECTING TO THE LINE UNDER TEST

Connecting to 4-Wire Circuits

Connect to the 701A **TRANSMIT** and **RECEIVE** connectors. Leave the **DIAL/X/MEAS** and **HOLD/OFF** switches in the "down" positions. Select the appropriate terminating impedance for the transmit/receive sides of the line. Normally the 600 ohm setting is used for 4-Wire circuits.

Connecting to 2-Wire Circuits

Connect to the 701A **RECEIVE** connector. Select the appropriate terminating impedance for the receive jack. Normally the 900 ohm setting is used for 2-Wire circuits. To dial and hold the line off-hook, perform the following steps:

01) Connect a telephone handset (butt-in) to the 701A **DIAL** jack. Set the **DIAL/X/MEAS** switch to **DIAL**.

02) Set the handset to off-hook. Dial the telephone number.

03) When the called party answers, set the **HOLD/OFF** switch to **HOLD**. The **HOLD** function of the 701A will hold the line off-hook in place of the handset. Remove the handset to avoid double terminating the the 2-Wire circuit.

Use the **DIAL/X/MEAS** switch to reverse the direction of the test without disconnecting the circuit (i.e., going on-hook). In the **MEAS** (measure) position, the 701A measures the received signal thru the **RECEIVE** jack; in the "**X**" (transfer) position, the 701A transmits test signals thru the same **RECEIVE** jack.

3.2 LOSS MEASUREMENT

APPLICATION NOTE

Circuit Loss is normally the first measurement made on a circuit, is a measurement of the power loss end-to-end. A 1004 Hz signal is transmitted at one end of the circuit and measured at the opposite end of the circuit. Loss is measured in dBm (decibels per milliwatt).

Setting the Transmitter

01) Set the **1004/QUIET/OSC** switch to **1004** Hz frequency.

02) Select the **LEVEL** function and the **TRMT** display in order to display the current transmit level and frequency.

03) Use the **LEVEL** knob to adjust to the desired transmit dBm level.

Note: It is normal practice to set the transmit level only at the beginning of the circuit loss test and not again for the remainder of the tests.

Measuring the Received Loss

01) Select the **LEVEL** function and the **RCV** display and verify that 1004 Hz is being received.

02) Read the loss in "dBm".

3.3 ATTENUATION DISTORTION & SLOPE MEASUREMENTS

APPLICATION NOTE

Attenuation Distortion is a measure of the variation in power loss versus the frequency of the circuit. For a complete test, readings are taken at 100Hz increments and are referenced to the circuit loss at 1004Hz. An abbreviated form of this test is known as the "gain/slope" test, with readings taken only at 404Hz and 2804Hz.

Setting the Transmitter

01) Set the **1004/QUIET/OSC** switch to **1004** Hz frequency.

02) Select the **LEVEL** function and the **TRMT** display in order to display the current transmit level and frequency.

03) After the level at 1004 Hz frequency has been measured, set the **1004/QUIET/OSC** to **OSC**. Use the **TUNE** knob to increase and decrease the frequency accordingly.

Measuring the Received Loss

01) Select the **LEVEL** mode and the **RCV** display and verify that 1004 Hz is being received. Read the loss in "dBm".

02) Subsequent measurements at other frequencies should be compared as to the difference in dB from the 1004 Hz zero reference point.

3.4 IDLE CHANNEL NOISE MEASUREMENT

APPLICATION NOTE

"Loss" and "Attenuation Distortion" are measurements of the power of the transmitted (i.e., wanted) signal. "Noise" measurements determine the amount of unwanted signal introduced by the transmission channel on the circuit. Noise can be caused by amplifiers, induction, crosstalk, multiplexing systems, signaling and telegraph equipment, various switching and signaling transients, and noisy power supplies.

Two different noise filters are used to "weight" the noise reading to correspond to the subjective effect of noise on the circuit. C-Message noise weighting is measured on voicegrade circuits since the C-Message filter is designed to approximate the frequency response of the human ear. The 3KHz Flat noise filter is roughly similar to the C-Message filter at high frequencies, but is more sensitive to low frequency noise.

Both C-Message and 3KHz Flat readings can be taken on a circuit and then compared to one another to determine the origin of the noise. If the readings are similar, the noise is in the high frequency range; if the 3KHz Flat reading is substantially higher than the C-Message reading, the cause of noise is low frequency (perhaps 60Hz hum from a noisy power supply).

Setting the Transmitter

Idle channel noise measurement is made with the transmit end of the circuit "quiet terminated". The background noise is measured.

01) Set the 1004/QUIET/OSC switch to the QUIET position.

Measuring the Idle Channel Noise

01) Select the NOISE mode and the RCV display and verify that opposite side of the line is quiet terminated (i.e., no tone being received).

02) Select the C-Message noise filter (4KHZ/WGTD). Read the C-Message noise in "dBrn".

02) Next, select the 3kHz Flat noise filter (4KHZ/FLAT). Read the 3kHz Flat noise in "dBrn".

03) If the readings are similar, the noise is in the high frequency range; if the 3KHz Flat reading is substantially higher than the C-Message reading, the cause of noise is at low frequency.

3.5 NOTCHED NOISE (NOISE WITH TONE) MEASUREMENT

APPLICATION NOTE

A 1004 Hz holding tone is applied to the transmit end of the circuit to activate (hold) compandors and other circuit equipment, which would otherwise be dormant on a circuit not carrying any traffic. Quantizing noise contribution from some digital carrier systems can also be measured. The 1004 Hz tone is then notched (eliminated) from the noise measurement so that only the background noise is measured.

Setting the Transmitter

01) Set the **1004/QUIET/OSC** switch to the **1004** position.

Measuring the Notch Noise

01) Select the **NOTCH** mode and the **RCV** display and verify that 1004 Hz is being received.

02) Select the C-Notch noise filter (**4KHZ/WGTD**). Read the C-Message Notched noise in "dBrn".

3.6 SIGNAL-TO-NOISE MEASUREMENT

APPLICATION NOTE

Signal-to-Noise expresses noise as a ratio (difference) between the power level of wanted 1004 Hz signal and the power level of unwanted background noise. The higher the signal-to-noise ratio, the better. Example:

1004Hz signal	74 dBrn (-16 dBm)
Noise	45 dBrn
Signal-to-Noise	29 dB

Setting the Transmitter

01) Set the **1004/QUIET/OSC** switch to the **1004** position.

Measuring the Signal-to-Noise Ratio

01) Select the **NOISE** mode and the **RCV** display and verify that 1004 Hz is being received.

02) Select the C-Message noise filter (**4KHZ/WGTD**). Read the level of the incoming 1004 Hz signal in "dBrn".

03) Select the **NOTCH** mode and the **RCV** display and verify that 1004 Hz is being received.

04) Select the C-Message Notch noise filter (**4KHZ/WGTD**). Read the noise in "dBrn".

05) Subtract the **NOTCH** reading from the **NOISE** reading. The difference between them is the Signal-to-Noise Ratio in "dB".

3.7 NOISE-TO-GROUND MEASUREMENT (Model 700A Adapter option is required)

APPLICATION NOTE

Noise-to-Ground measures the power influence appearing between the Tip and Ring leads (shorted togeather) and ground. The noise currents which are seeking ground are provided a path though the test set to ground. The measurement is useful in determining the presence and magnitude of power line induction.

Setting the Transmitter

Noise-to-Ground measurement is made with the transmit end of the circuit "quiet terminated".

01) Set the **1004/QUIET/OSC** switch to the **QUIET** position.

Measuring Noise-to-Ground

Note: The 700A Noise-to-Ground adapter should be used with either of the following:

- 310-to-Alligator clip (three wire) test cable. Available from CXR under part number 6010-0710-78.
- 310-to-310 test cable with shield (sleeve) ground pigtail.

01) Connect the test cable to the line under test. The **GREEN** lead of the test cable **must** be connected to **GROUND**.

02) Plug the other end of the test cable into the 700A Input Jack.

03) Optional. If the 701A is operating under AC power, it is advisable to connect the 700A **GROUND LUG** to cable ground using a separate clip lead. This connects the 701A test set to ground also.

If a difference in potential exists between "green" AC ground and cable ground, AC noise may be induced in the measurement. For best results, always make the Noise-to-Ground measurement using battery power on the 701A.

04) **Only** after grounding the test cable (and 700A, if necessary) insert the 700A into the **RECEIVE** jack on the 701A.

05) On the 700A, set the **600-900 ohms** switch to match the impedance of the line under test. Set the 701A **TERM/BRDG** pushbutton to **BRDG**.

06) On the 701A, select the **NOISE** mode and the **RCV** display and verify that opposite side of the line is quiet terminated (i.e., no tone being received).

07) Select the C-Message noise filter (**4KHZ/WGTD**). Add 40 dB to the displayed reading and read the C-Message noise-to-ground in "dBrn".

APPENDIX A — PRODUCT SPECIFICATIONS

Transmitter

Fixed frequency	1004 Hz ± 0.5 Hz
Variable frequency ranges	50 to 4000 Hz 4KHZ mode; .25k to 20k Hz 20KHZ mode
Output level range	+13 to -40 dBm
Total distortion	200 to 4000 Hz, >50 dB below fundamental; All other frequencies, >40 dB below fundamental

Level Measurement

Measurement range	-50 to +13 dBm
Measurement accuracy	1004 Hz, ± 0.1 dB; 200 Hz to 15k Hz, ± 0.2 dB; 50 Hz to 20k Hz, ± 0.5 dB
Measurement resolution	0.1 dB

Frequency Measurement

Frequency range	50 Hz to 20k Hz
Level range	+13 to -50 dBm
Measurement accuracy	± 1 count (with S/N of 20 dB or more)
Measurement resolution	1 Hz in 4KHZ mode; 10 Hz in 20KHZ mode

Noise Measurement

Weighting networks	C-Message, 3kHz Flat, Program, 15kHz Flat
Measurement accuracy	20 to 99 dBrn, ± 1 dB; 10 to 19 dBrn, ± 2 dB
Measurement resolution	1 dB
Notch Filter attenuation	50 dB or more, 995 to 1025 Hz

Noise-to-Ground Measurement (700A adapter option required)

Measurement range	50 to 130 dBrn
Measurement accuracy	± 1.5 dB
Ring-to-ground impedance	100k ohm
Tip-to-ground impedance	100k ohm

Other

Terminating impedances	600, 900 ohms, transmit; 600, 900 ohms, and bridging (>25k ohms) receive
Longitudinal balance	90dB at 50Hz to 120Hz; decreasing 20dB per impedance decade
High Voltage Protection	Per para. 6.4 of IEEE Std 743-1984

Hold Circuit

(1700 ohm loop)	Regulated at 20mA, 42.5 Vdc

Environmental

Operating temp	0 to 50C
Storage temp	-25 to +75C
Relative humidity	0 to 90% RH, non-condensing

Mechanical

Height	5in (12.7cm)
Width	7in (17.8cm)
Depth	12in (30.5cm)
Weight	9.2 lbs (4.2 kg)

AC Power

Input voltage	115 or 230 Vac
Frequency	60 or 50 Hz

Battery Power

Type	Internal NiCad
Operating time	6 hours (typical)
Recharge time	8 hours (typical)
Discharge/recharge cycles	2000 (typical)

APPENDIX B - WARRANTY AND REPAIR

Standard Warranty

Products manufactured by CXR Telcom Corporation are guaranteed to be free of defects in materials and workmanship for a period of two years from the date of shipment. CXR will accept returned items, transportation prepaid to the service center, for repair during the warranty period at no cost to the customer, provided that the products have not been subjected to improper installation, accident, misuse, neglect, or unauthorized alterations.

Certification

CXR Telcom Corporation certifies that all instruments are thoroughly tested and inspected and found to be meet published specifications when shipped from the factory.

Inspection

All CXR manufactured products are carefully inspected and thoroughly tested prior to shipment. Modern packaging techniques are used to prevent damage prior to shipment.

If goods are received in a damaged condition, A CLAIM SHOULD BE FILED WITH THE TERMINATING CARRIER IMMEDIATELY. Normally, the carrier will want to inspect the shipping carton and packing materials. A copy of this claim should be forwarded to CXR.

If equipment that has no apparent damage does not operate properly when tested in accordance with the instructions, it should be returned to the addresses shown for repair or replacement. Unauthorized field repairs or modifications will invalidate the warranty.

When returning equipment for repair, utmost care should be taken to avoid shipping damage. If available, use the original cartons and packing material. Shipping charges should be prepaid.

Returned equipment that is covered by warranty will be repaired as soon as possible and shipped prepaid.

If the equipment is not covered by warranty, a quotation for repair charges will be made first. Repairs will be made after authorization (purchase order) to proceed is received.

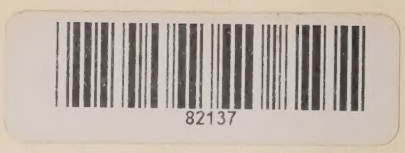
Service Centers

Instruments should be returned to:

CXR Telcom Corporation
Attn: Customer Service
755 Ravendale Drive
Mountain View, CA 94043
(415)965-7100

CXR Telcom Corporation
Attn: Customer Service
2960 Woodbridge Ave
Edison, NJ 08837
(201)494-8822

Be sure to include as detailed a description as possible of the instrument failure and the name of the person to contact at your company.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